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Regarding: Health hazards of base stations and other sources of radiofrequency electromagnetic field (RF-EMF) exposure

On 31 May 2011 IARC categorised radiofrequency electromagnetic fields (RF-EMF) from mobile phones, and from other devices that emit similar non-ionising electromagnetic fields, as a Group 2B, i.e. a 'possible', human carcinogen.[1,2] Nine years earlier IARC had also classified extremely low frequency (ELF) magnetic field as Group 2B carcinogen.[3]

The IARC decision on mobile phones was based mainly on two sets of case-control human studies on brain tumor risk; our studies from Sweden (the Hardell group)[4-11] and the IARC Interphone study (also preprint studies available).[12-14] Both provided complementary and supportive results on positive associations between two types of brain tumors; glioma and acoustic neuroma, and exposure to RF-EMF from wireless phones. There was '"limited' evidence in experimental animals for the carcinogenicity of RF-EMF. The Working Group also reviewed studies with endpoints relevant to mechanisms of carcinogenesis, including genotoxicity, effects on immune function, gene and protein expression, cell signalling, oxidative stress, and apoptosis. Studies of the possible effects of RF-EMF on the blood-brain barrier and on a variety of effects in the brain were also considered. These results provided weak mechanistic evidence relevant to RF-EMF-induced cancer in humans.[1,2]

The final IARC decision was confirmed by voting of 27 present experts (the undersigned was part of the expert group). A large majority of the participants voted to classify RF-EMF radiation as 'possibly carcinogenic' to humans, Group 2B. The decision was also based on occupational studies. IARC concluded that *"Human exposures to RF-EMF (frequency range 30 kHz–300 GHz) can occur from use of personal devices (eg,mobile telephones, cordless phones, Bluetooth, and amateur radios), from occupational sources (eg, highfrequency dielectric and induction heaters, and high-powered pulsed radars), and from environmental sources such as mobile-phone base stations, broadcast antennas, and medical applications. For workers, most exposure to RF-EMF comes from near-fi eld sources, whereas the general population receives the highest exposure from transmitters close to the body, such as handheld devices like mobile telephones."*[1]

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Bradford Hill gave a presidential address at the British Royal Society of Medicine in 1965 on association or causation related to smoking and lung cancer risk. That presentation provides a helpful framework for evaluation of the brain tumor risk from RF-EMF.[15] We used his viewpoints to evaluate association *versus* causation on RF-EMF and brain tumor risk.[16] All nine issues on causation according to Hill were evaluated. Based on Hill's viewpoints and his discussion on how these issues should be used, the conclusion of our review was that glioma and acoustic neuroma are caused by RF-EMF emissions from wireless phones. This conclusion is further supported by recent publications on brain tumor risk associated with use of wireless phones, see also the BioInitiative Report 2012 (http://www.bioinitiative.org). According to the IARC Preamble, the classification should be group 1, i.e., "the agent is carcinogenic to humans". Thus urgent revision of current guidelines for exposure is needed. This conclusion should be considered in all situations with human exposure to RF-EMF, **including cell towers (base stations)**.

Thank you for your attention to this letter.

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